

# A POSSIBLE CORRELATION BETWEEN EGRET SOURCES AND AN AIR-BORNE EXPERIMENT

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## Abstract

In 1989, an air-borne experiments (VEGA experiment) aiming at the detection of a few 10 GeV  $\gamma$ -ray were carried out. In these experiments, nine point-source candidates along the Galactic plane were reported. In these candidates, the five of five highest significance candidates positionally coincide with the EGRET galactic plane sources.

## 1 Introduction

Recently, the EGRET(CGRO) developed a new era of the GeV- $\gamma$ -ray astrophysics. More than ten times of point sources were discovered by this satellite [1]. On the other hand, in 1989, we carried out an air-borne experiment for detecting a few ten GeV  $\gamma$ -rays [2, 3, 4]. In the first experiment, there was an indication of the existence of the galactic plane sources. We report a possible correlation between the EGRET sources and the air-borne experiment which was first noticed by J. R. Mattox (GSFC).

## 2 VEGA Experiment

The experimental principle of the air-borne experiment (VEGA experiment) are as follows. High momentum secondary electrons ( $>1$  GeV) inside air showers have almost the same directions with respect to the incident  $\gamma$ -rays. The ambiguities of the direction are due to the multiple scattering and the geomagnetic field, which are estimated to be  $\sim 0.5$  degree. The detail can be found in Reference [2].

In the experiments, we used the flight between Narita (Japan) and Sidney (Australia). The field of view was focused at the galactic plane between  $l=-20$  to  $60$  degrees. In the first experiment, we have detected some fluctuation concentrated along the galactic plane [2].

## 3 Possible Correlation

The galactic plane sources of the EGRET are catalogued in Reference [1], in Table 4a, and 4b. They are plotted in Figure 1. The typical error circles are 30 arcmin which are indicated with circles in Figure 1. The five highest significance peaks by the VEGA experiment are also shown in Figure 1 tagged by A, B, C, D, and E. The magnitudes of the error circles are 1.6 degree [4]. All of five positionally coincide with the EGRET sources which are listed in Table 1. The three of five sources are transient and two are considered to be extended or multiple sources by the EGRET observation. The probability of the accidental coincidence are considered to be 2%.

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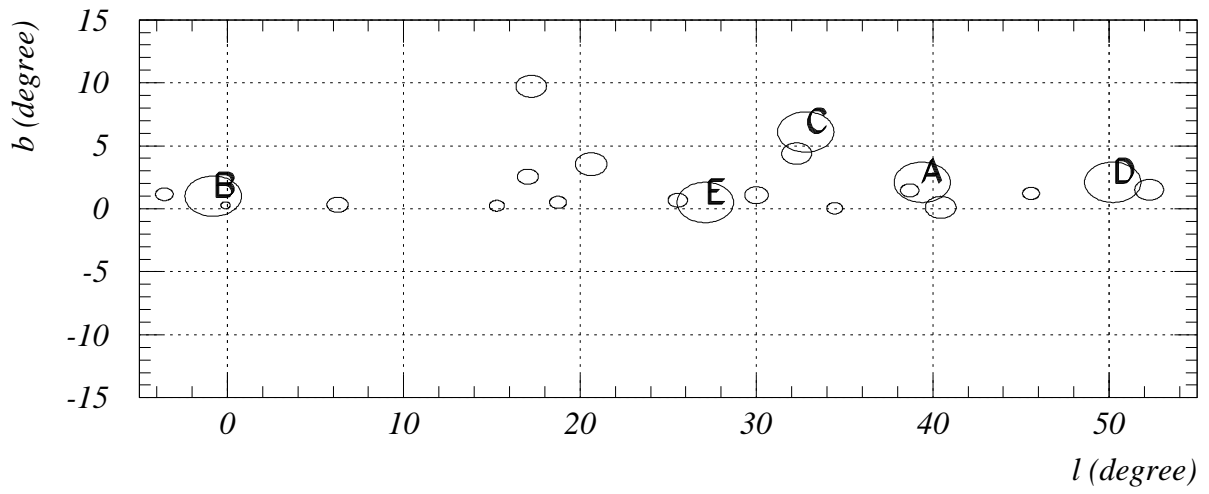


Figure 1: Positions of galactic plane sources. The circles represent the measurement errors. The circles marked by the alphabets indicate the VEGA source candidates.

VEGA source-ID	EGRET source-ID	Comment
A	GRO J1857+05	1),2)
B	GRO J1732-31	
C	GRO J1834+01	2)
D	GRO J1921+17	1)
E	GRO J1835-06	2)

Table 1: Relations between the VEGA source candidates and the EGRET sources. The comments are 1) extended or multiple sources, and 2) transient source.

## 4 Discussion

In spite of a positional coincidence, there are two problems as follows.

1. The intensities of these sources by the VEGA experiment are more than 10 times bigger than those obtained by the EGRET.
2. In the succeeding VEGA experiments, the existence of these sources could not be confirmed [4].

However, by checking carefully on the distributions of the electron arrival directions in Reference [4], it is possible to say that there are some fluctuations in these signal regions. Therefore if the positional coincidence is a real effect, these sources must be strongly time dependent. It is very interesting to observe these by different energy regions such as X-ray and VHE- $\gamma$ -ray.

## 5 Summary

A possible correlation between the EGRET sources and the air-borne experiment was found. The five of five highest significance source candidates detected by the VEGA experiment positionally coincide with the EGRET galactic plane sources. Three of five were transient sources. Efforts for establishment, such as X-ray and air-Čerenkov observations, are important.

## Acknowledgement

This correlation was first noticed by J. R. Mattox (GSFC) and I greatly appreciate it. This work was supported by a Grant-in-Aid in Scientific Research in Priority Areas from the Japan Ministry of Education, Science, and Culture.

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